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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/734,261	12/15/2003	Mitsugu Sato	H6808.0005/P005-A	1481

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EXAMINER	
JOHNSTON, PHILLIP A	

ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 02/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

11-A

Office Action Summary	Application No.	Applicant(s)	
	10/734,261	SATO ET AL.	
	Examiner	Art Unit	
	Phillip A. Johnston	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 December 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *24-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *24-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Detailed Action

1. This Office Action is submitted in response to amendment dated 12-03-2004, wherein claims 24 and 27 are amended. Claims 24-32 are pending.

Claims Rejection – 35 U.S.C. 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 24-30, and 32 stand rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,627,373, to Keese.

Keese (373) clearly discloses the following;

(a) An electron beam alignment correction apparatus and method that includes a source, an alignment deflector, and a pattern recognition circuit 48 that computes the axis of beam distortion between successive images. Once this axis is determined, the control circuit generates astigmatism coil control signals for compressing the beam along such axis. The astigmatism control signal magnitude then is indexed and the process repeated iteratively until the axis of highest beam distortion is less than a threshold value. When such condition is reached, the electron beam is considered to

be substantially radially uniform, as recited in claims 24,25,27, and 32. See Column 3, line 47-53; and Column 6, line 52-65.

(b) Pattern recognition circuit 48 analyzes the image of magnified boundary portion 68 and generates a signal IND for indicating the position of the image of boundary portion 68 in the field of view. A indicator signal IND is generated for each of the extremes of the focus range. Pattern recognition circuit 48 outputs the respective indicator signals IND to control circuit 50. Control circuit 50 stores and compares portion 68 location indicator signals IND for positions in the field of view of magnified portion 68 at the extremes of the focus range. Control circuit 50 detects any translation of the magnified portion 68 and generates alignment coil control signals LC1 and LC2. Control circuit 50 provides signals LC1 and LC2 to alignment coils 22 for adjusting electron beam alignment, as recited in claim 26. See Column 6, line 52-65.

(c) Pattern recognition circuit 48 analyzes detector signal FD for imaged features of specimen S, such as position in the field of view and sharpness of the edge image. For example, in one embodiment pattern recognition circuit 48 determines the absolute value of the peak first derivative of the smoothed image intensity of each raster scan line and derives an average over all scan lines. This information is contained in signal IND provided to control circuit 50. Control circuit 50 stores and analyzes signals IND, and calculates corrections to beam alignment and astigmatism. Control circuit 50 generates control signals LC1 and LC2 for automatically correcting beam alignment, and generates control signal ASC for automatically correcting beam

astigmatism, as recited in claims 28-30, and 32. See Column 5, line 37-53; and Column 8, line 3-39.

Claims Rejection – 35 U.S.C. 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 24-32 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,627,373, to Keese, in view of Onoguchi, U.S. Patent No. 6,067,164.

Keese (373) as applied above discloses all the limitations of claims 24-32 but fails to teach the use of a two-dimensional Fourier transform to quantify the image, as recited in claim 31. However, Onoguchi (164) discloses an astigmatism correction apparatus for correcting an astigmatism in an electron optics device by adjusting a stigmater of a charged particle beam optical system in the electron optics device, comprising: a secondary particle signal extraction unit for extracting secondary particle signals resulting from a two-dimensional scan of a charged particle beam over a sample by the electron optics device; a Fourier transform unit for calculating a power

spectrum by applying a two-dimensional Fourier transform to the secondary particle signals extracted by the secondary particle signal extraction unit; a binarization unit for binarizing the power spectrum calculated by the Fourier transform unit to obtain a binarized image; an axis extraction unit for obtaining a principal axis and an axis perpendicular to the principal axis of the binarized image obtained by the binarization unit; an astigmatism information calculation unit for determining an intensity and a direction of the astigmatism by obtaining a distance between two points at which a sample image region in the binarized image intersects with the principal axis and a distance between two points at which the sample image region in the binarized image intersect with the axis perpendicular to the principal axis; and an adjustment unit for adjusting the stigmater of the charged particle beam optical system according to the intensity and the direction of the astigmatism determined by the astigmatism information calculation unit. See Column 4, line 65-67; Column 5, line 1-25; Column 19, line 51-67; and Column 20, line 1-3.

Therefore it would have been obvious to one of ordinary skill in the art that the electron beam alignment correction apparatus and method of Keese (373) can be modified to use the Fourier transform in accordance with Onoguchi (164), to apply a two-dimensional Fourier transform to the secondary particle signals, thereby adjusting the stigmater of the charged particle beam optical system according to the intensity and the direction of the astigmatism determined by the astigmatism information calculation unit.

Examiners Response to Arguments

6. Applicant's arguments filed 12-03-2004 have been fully considered but they are not persuasive.

Arguments 1-3.

Applicant states that,

(a) "Keese does not, however, disclose or suggest the control device of claim 24, as amended. Keese merely indicates that a deviation on an image is detected. Keese does not disclose or suggest that a predetermined signal is fed to a deflector and that the direction and amount of deflection are determined based on the signal, as in the invention of claim 24, as amended."

(b) "Keese does not disclose or suggest the step of determining the presence or absence of structural information necessary for the calculation, as recited in claim 28, and the Office Action provides no explanation to the contrary. Consequently, claim 28 should be allowable over Keese, and dependent claims 29-31 should be allowable over Keese along with claim 28 and for other reasons."

(c) "With respect to claim 32, although Keese refers to the order of adjustment and astigmatism adjustment, it does not disclose or suggest the order of an astigmatism corrector and an objective lens as recited in claim 32. Consequently, claim 32 should be allowable over Keese."

The applicant is respectfully directed to Keese (373), Column 4, lines 39-43, and lines 55-59, which state; Condenser lenses 19, 20 include one or more beam

alignment coils 22 respectively, for aligning the electron beam and for condensing the beam into a spot approximately 10 nanometers (nm) or less across. Condenser lenses 19 and 20 align the electron beam in response to lens control signals LC1 and LC2, respectively.

An astigmatism coil 25 adjusts radial uniformity of the electron beam for correcting electron beam astigmatism. Astigmatism coil 25 is controlled by astigmatism coil control signal ASC.

The examiner has interpreted that the alignment coils are used to deflect the beam based upon control signals supplied, for example LC1, LC2, and ASC. These control signals determine the amount and direction of the deflection in keeping with the concept of correcting beam alignment used in accordance with Keese (373), which implies that when a beam is out of alignment it's location must be adjusted by an amount and in a direction that positions the beam in the correct location.

Also Column 5, line 40-54, which states; Pattern recognition circuit 48 analyzes detector signal FD for imaged features of specimen S, such as position in the field of view and sharpness of the edge image. For example, in one embodiment pattern recognition circuit 48 determines the absolute value of the peak first derivative of the smoothed image intensity of each raster scan line and derives an average over all scan lines. This information is contained in signal IND provided to control circuit 50. Control circuit 50 stores and analyzes signals IND, and calculates corrections to beam alignment and astigmatism. Control circuit 50 generates control signals LC1 and LC2

for automatically correcting beam alignment, and generates control signal ASC for automatically correcting beam astigmatism.

The examiner has interpreted that Keese's use of imaged features, such as sharpness of the edge of the image, to calculate beam alignment signals is equivalent to using a control device that determines the presence or absence of structural information necessary for calculating the amount of beam translation, as recited in claim 28.

As well as, Column 8, line 23-30, which states; Referring to FIGS. 6 and 7, aperture 60 is first imaged along an axis that is substantially orthogonal to electron beam axis A_e. In this case, the axis is the y axis.

The focus of objective lens 28 is varied positively and negatively between extremes of the focal range. In a preferred embodiment, computer 40 automatically varies the focus of objective lens 28.

Pattern recognition circuit 48 analyzes the image of magnified boundary portion 68 and generates a signal IND for indicating the position of the image of boundary portion 68 in the field of view. A indicator signal IND is generated for each of the extremes of the focus range. Pattern recognition circuit 48 outputs the respective indicator signals IND to control circuit 50. Control circuit 50 stores and compares portion 68 location indicator signals IND for positions in the field of view of magnified portion 68 at the extremes of the focus range. Control circuit 50 detects any translation of the magnified portion 68 and generates alignment coil control signals

LC1 and LC2. Control circuit 50 provides signals LC1 and LC2 to alignment coils 22 for adjusting electron beam alignment.

The examiner has interpreted that the axis of the beam is adjusted relative to the astigmatism corrector and the objective lens, as recited in claim 32.

Argument 4.

Applicant states that, "Moreover, with respect to claims 28-31, although Onoguchi discloses that a Fourier transform is performed, it does not disclose or suggest that a Fourier transform is carried out for the determination recited in the claims. Consequently, claims 28-31 should be allowable over the art of record."

The applicant is also respectfully directed to Onoguchi (164), Column 4, line 65-67 and Column 5, line 1-25, which states; According to another aspect of the present invention there is provided an astigmatism correction apparatus for correcting an astigmatism in an electron optics device by adjusting a stigmater of a charged particle beam optical system in the electron optics device, comprising: a secondary particle signal extraction unit for extracting secondary particle signals resulting from a two-dimensional scan of a charged particle beam over a sample by the electron optics device; a Fourier transform unit for calculating a power spectrum by applying a two-dimensional Fourier transform to the secondary particle signals extracted by the secondary particle signal extraction unit; a binarization unit for binarizing the power spectrum calculated by the Fourier transform unit to obtain a binarized image; an axis extraction unit for obtaining a principal axis and an axis perpendicular to the principal axis of the binarized image obtained by the binarization unit; an astigmatism

information calculation unit for determining an intensity and a direction of the astigmatism by obtaining a distance between two points at which a sample image region in the binarized image intersects with the principal axis and a distance between two points at which the sample image region in the binarized image intersect with the axis perpendicular to the principal axis; and an adjustment unit for adjusting the stigmater of the charged particle beam optical system according to the intensity and the direction of the astigmatism determined by the astigmatism information calculation unit.

The examiner has interpreted from the Onoguchi (164) reference above, that control device quantification; i.e., determining direction and amount of deflection applied to the alignment deflector, is clearly performed by Onoguchi (164) using the Fourier transform of the image, as recited in claim 31.

Conclusion

7. The Amendment filed on 12-03-2004 under 37 CFR 1.131 has been considered but is ineffective to overcome the Keese (373) and Onoguchi (164) references.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached on Monday-Friday from 7:30 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor John Lee can be reached at (571) 272-2477. The fax phone number for the organization where the application or proceeding is assigned is 703 872 9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PJ
February 22, 2005

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